In the Claims

A complete listing of all claims in this application that replaces all prior versions of the claims is set forth below.

Please amend claim 23 as set forth below.

1. (Previously presented) A computer system that generates a set of artificial implant model data used to fabricate an artificial implant that provides a set of ranges of motions for a joint depicted in joint motion image data for a plurality of corresponding joints in a plurality of subjects comprising:

an anthropometric data analyzer executing on a computer for receiving joint motion image data representative of the plurality of corresponding joints in the plurality of subjects, and the received data being displayed by the anthropometric analyzer on a display to enable an operator to select points that identify a plurality of geometric dimensions and ranges of values for the identified geometric dimensions;

an implant model generator executing on the computer, the implant model generator receiving the identified geometric dimensions and the ranges of values for the identified geometric dimensions that were generated by the anthropometric data analyzer and generating a set of artificial implant model data for fabricating the artificial implant that corresponds to the identified geometric dimensions and a set of discrete values for the identified geometric dimensions for the artificial implant from the identified geometric dimensions and the ranges of values for the identified geometric dimensions;

a kinematic model simulator executing on the computer, the kinematic model simulator incorporating the set of artificial implant model data generated by the implant

model generator in a kinematic model of the joint, and simulating movement of the joint with the kinematic model to generate motion versus time data;

a motion data analyzer executing on the computer that compares the motion versus time data generated by the kinematic model simulator with motion versus time data from the joint motion image data used to identify the geometric dimensions and the ranges of values for the identified geometric dimensions that were used to generate the set of artificial implant model data to determine whether the artificial implant corresponding to the set of artificial implant model data provides the set of ranges of motions for the joint depicted in the joint motion image data; and

a database coupled to the computer executing the motion data analyzer to receive and store the set of artificial implant model data in a database file, in response to the motion data analyzer determining the artificial implant corresponding to the set of artificial implant model data provides the set of ranges of motions for the joint depicted in the joint motion image data to enable the artificial implant model data to be retrieved for fabricating the artificial implant.

2. (Previously presented) The computer system of claim 1 further comprising:

the motion data analyzer receives the motion versus time data generated by the kinematic model simulator and generates differential dimensional data for modifying the set of artificial implant model data in response to the motion versus time data generated by the kinematic model simulator indicating that the artificial implant corresponding to the set of artificial implant model data does not provide the set of ranges of motions for the joint depicted in the joint motion image data.

3. (Previously presented)The computer system of claim 2 wherein the implant model generator receives the differential dimensional data from the motion data analyzer and modifies the set of artificial implant model data with the differential dimensional data to generate a second set of artificial implant model data;

the kinematic model simulator incorporates the second set of artificial implant model data in the kinematic model of the joint to generate a second kinematic model of the joint and simulates movement of the joint with the second kinematic model to generate a second set of motion versus time data;

the motion data analyzer determines whether the artificial implant corresponding to the second set of artificial implant model data provides the set of ranges of motions for the joint depicted in the joint motion image data; and

the database stores the second set of artificial implant model data in a database file in response to the determination that the artificial implant corresponding to the second set of artificial implant model data provides the set of ranges of motions for the joint depicted in the joint motion image data to enable the second set of artificial implant model data to be retrieved for fabricating the artificial implant.

4. (Canceled).

5. (Previously presented) The computer system of claim 1 wherein the anthropometric data analyzer receives computed tomography (CT) data for the plurality of corresponding joints for the plurality of subjects for analysis.

6. (Previously presented) The computer system of claim 1 wherein the anthropometric data analyzer receives magnetic resonance image (MRI) data for the plurality of corresponding joints for the plurality of subjects for analysis.

7. (Previously presented) The system of claim 1 wherein the anthropometric data analyzer executing on the computer analyzes static image data.

8. (Previously presented) The computer system of claim 7 wherein the anthropometric data analyzer executes on a computer aided design (CAD) system to enable the operator to select a feature in the static image data to define a geometric dimension and to measure the defined geometric dimension.

9. (Canceled).

10. (Previously presented) The computer system of claim 1 the system further comprising:

a patient model emulator executing on the computer to generate emulation force vectors that are used by the kinematic model simulator to simulate movement of the joint with the kinematic model.

11. (Previously presented) The computer system of claim 10 wherein the patient model emulator generates the emulation force vectors from image data of the joint in motion.

12. (Previously presented) The computer system of claim 11 wherein the patient model emulator generates the emulation force vectors from fluoroscopic image data of the joint in motion.

13. (Previously presented) The computer system of claim 12 wherein the kinematic model simulator receives the emulation force vectors generated by the patient model emulator and applies the emulation force vectors to the kinematic model to generate motion versus time data for the simulated movement of the joint.

14. (Previously presented) The computer system of claim 13 wherein the motion data analyzer compares the motion versus time data that was generated by the kinematic model simulator to motion versus time data from the fluoroscopic image data used to generate the emulation force vectors.

15. (Canceled).

16. (Previously presented) The computer system of claim 14 wherein the motion data analyzer generates a set of differential dimensional data for modification of the set of artificial implant model data to reduce a likelihood of motion interference occurring from an implantation of the artificial implant corresponding to the set of artificial implant model data.

17. (Canceled).

18. (Previously presented) A method for operating a computer system to generate a set of artificial implant model data used to fabricate an artificial implant that provides a set of ranges of motions for a joint depicted in joint motion image data for a plurality of corresponding joints in a plurality of subjects comprising:

displaying joint motion image data for the plurality of corresponding joints in the plurality of subjects to enable an operator to identify a plurality of geometric dimensions and ranges of values for the identified geometric dimensions;

generating the set of artificial implant model data for fabricating the artificial implant that corresponds to the identified geometric dimensions and a set of discrete values for the identified geometric dimensions for the artificial implant from the identified geometric dimensions and the ranges of values for the identified geometric dimensions;

incorporating the set of artificial implant model data in a kinematic model of the joint;

generating emulation force vectors from image data of the joint in motion;

applying the emulation force vectors to the kinematic model to simulate movement of the joint with the kinematic model and generating motion versus time data for the simulated movement of the joint;

comparing the motion versus time data generated for the simulated movement of the joint to motion versus time data from the joint motion image data used to identify the geometric dimensions and the ranges of values for the identified geometric dimensions that were used to generate the set of artificial implant model data to determine whether

the artificial implant corresponding to the set of artificial implant model data provides the set of ranges of motions for the joint depicted in the joint motion image data; and

storing the set of artificial implant model data in a database file in response to the determination that the artificial implant corresponding to the set of artificial implant model data provides the set of ranges of motions for the joint depicted in the joint motion image data to enable the artificial implant model data to be retrieved for fabricating the artificial implant.

19. (Previously presented) The method of claim 18 further comprising:

generating differential dimensional data to modify the set of the artificial implant model data in response to the comparison of the motion versus time data generated from the simulated movement of the joint with the kinematic model indicating that the artificial implant corresponding to the set of artificial implant model data produces motion interference during the simulated movement of the joint with the kinematic model; and

modifying the set of artificial implant model data with the generated differential dimensional data to generate a second set of artificial implant model data.

20. (Previously presented) The method of claim 19 further comprising:

incorporating the second set of artificial implant model data in the kinematic model of the joint to generate a second kinematic model of the joint;

applying the emulation force vectors to the second kinematic model to simulate movement of the joint and generating motion versus time data for the simulated movement of the joint with the second kinematic model;

comparing the motion versus time data generated for the simulated movement of the joint with the second kinematic model to motion versus time data from the joint motion image data used to identify the geometric dimensions and the ranges of values for the identified geometric dimensions to determine whether the artificial implant corresponding to the second set of artificial implant model data provides the set of ranges of motions for the joint depicted in the joint motion image data; and

storing the second set of artificial implant model data in a database file in response to the determination that the artificial implant corresponding to the second set of artificial implant model data provides the set of ranges of motions for the joint depicted in the joint motion image data to enable the second set of artificial implant model data to be retrieved for fabricating the artificial implant.

21. (Previously presented) The method of claim 18 wherein the display of joint motion data includes display of computed tomography (CT) data for the plurality of corresponding joints in the plurality of subjects.

22. (Previously presented) The method of claim 18 wherein the display of joint motion data includes display of magnetic resonance image (MRI) data for the plurality of corresponding joints in the plurality of subjects.

23. (Currently amended) The method of claim 18 wherein the display of joint motion data includes display of three dimensional image data for the plurality of corresponding joints in the plurality of subjects.

24. (Previously presented) The method of claim 18 wherein the display of the joint motion image data includes enabling an operator to select a feature in static image data to define a geometric dimension and to measure the defined geometric dimension.

Claims 25-26 (Canceled).

27. (Previously presented) The method of claim 19 wherein the artificial implant model data modification includes modification of the set of artificial implant model data using fluoroscopic image data of the plurality of corresponding joints in motion from the plurality of subjects.

Claims 28-29. (Canceled).

30. (Previously presented) The method of claim 18 wherein the comparison of the motion versus time data generated for the simulated movement of the joint to the motion versus time data from the joint motion image data includes identifying motion interference during the movement of the joint.

31. (Previously presented) The method of claim 30 wherein the comparison of the motion versus time data generated for the simulated movement of the joint to the motion versus time data from the joint motion image data includes generating a set of differential dimensional data for modification of the set of artificial implant model data to reduce a

likelihood of motion interference occurring from an implantation of the artificial implant corresponding to the set of artificial implant model data.

32. (Previously presented) A computer system that generates a set of artificial implant model data used to fabricate an artificial implant that provides a set of ranges of motions for a joint depicted in joint motion image data for a plurality of corresponding joints in a plurality of subjects, comprising:

a motion data analyzer executing on a computer for receiving joint motion image data for the plurality of corresponding joints in the plurality of subjects, the motion data analyzer grouping the joint motion image data into sets that are correlated by ranges of motions for a particular activity for the joint depicted in the joint motion image data;

an anthropometric data analyzer executing on the computer to display one of the sets of joint motion image data correlated by the ranges of motions for the particular activity to enable an operator to identify geometric dimensions and measurement ranges of values for the identified geometric dimensions from the one set of joint motion image data;

an artificial implant model generator executing on the computer to generate a set of artificial implant model data for fabricating the artificial implant that corresponds to the identified geometric dimensions and a set of discrete values for the identified geometric dimensions for the artificial implant from the identified geometric dimensions and the measurement ranges of values for the identified geometric dimensions for the one set of joint motion image data correlated by the ranges of motions for the particular activity;

a kinematic model simulator executing on the computer, the kinematic model simulator simulating movement of the joint with the artificial implant model data received from the artificial implant model generator and generating motion versus time data from the simulated movement of the joint for the one set of joint motion image data correlated by the ranges of motions for the particular activity;

the motion data analyzer comparing the motion versus time data generated by the kinematic model simulator with motion versus time data from the one set of joint motion image data used to identify the geometric dimensions and the measurement ranges of values for the identified geometric dimensions that were used to generate the set of artificial implant model data to determine whether the artificial implant corresponding to the set of artificial implant model data provides the set of ranges of motions for the joint for the particular activity for the joint depicted in the one set of joint motion image data; and

a database coupled to the computer executing the motion data analyzer, the database receiving and storing the artificial implant model data in a database file in response to the comparison of the motion versus time data indicating the artificial implant model data provides the set of ranges of motions for the joint for the particular activity for the joint depicted in the one set of joint motion image data, for later retrieval and use in fabrication of an artificial implant.

33. (Previously presented) The computer system of claim 32 wherein the motion data analyzer receives fluoroscopic image data of the plurality of corresponding joints in motion from a database in which fluoroscopic image data are stored.

Claims 34-36 (Canceled).

37. (Previously presented) The computer system of claim 33 further comprising:

the motion data analyzer receives the motion versus time data from the kinematic model simulator and generates differential dimensional data for modifying the artificial implant model data in response to the comparison of the motion versus time data from the simulated movement of the joint to the motion versus time data from the one set of joint motion image data indicating that the artificial implant corresponding to the artificial implant model data does not provide the ranges of motions for the particular activity for the joint depicted in the one set of joint motion image data.

38. (Previously presented) A method for operating a computer system to generate an artificial implant design corresponding to a set of artificial implant model data that is used to fabricate an artificial implant that provides a set of ranges of motions for a joint depicted in joint motion image data for a plurality of corresponding joints in a plurality of subjects, comprising:

executing a program on a computer to analyze joint motion image data for the plurality of corresponding joints in the plurality of subjects to group the joint motion image data into sets, each set corresponding to a set of ranges of motions for an activity for the joint depicted in the joint motion image data;

executing a program on the computer to display one of the sets of the joint motion image data to enable an operator to identify geometric dimensions and measurement ranges of values for the identified geometric dimensions, the identified geometric

dimensions and measurement ranges of values for the identified geometric dimensions corresponding the one set of joint motion image data;

executing a program on the computer to generate a set of artificial implant model data for fabricating the artificial implant that corresponds to the identified geometric dimensions and a set of discrete values for the identified geometric dimensions for the artificial implant from the identified geometric dimensions and the measurement ranges of values for the identified geometric dimensions for the one set of joint motion image data;

executing a program on the computer to incorporate the set of artificial implant model data into a kinematic model of the joint;

executing a program on the computer to simulate movement of the joint with the kinematic model of the joint and generating motion versus time data from the simulation of movement of the joint with the kinematic model of the joint;

executing a program on the computer to compare the generated motion versus time data from the simulation of movement of the joint to motion versus time data for the ranges of motions for the activity depicted in the one set of joint motion image data used to generate the set of artificial implant model data; and

executing a program on the computer to store the set of artificial implant model data in a database file in response to the motion versus time data generated for the simulated movement of the joint corresponding to the ranges of motions for the activity depicted in the one set of joint motion image data, for later retrieval and use in fabrication of an artificial implant.

39. (Previously presented) The method of claim 38 wherein the analysis of the joint motion image data performed by the computer includes receiving fluoroscopic image data of the plurality of corresponding joints in motion in the plurality of subjects.

Claims 40-42 (Canceled).

43. (Previously presented) The method of claim 38 wherein the comparison of the generated motion versus time data from the simulation of movement of the joint to motion versus time data for the ranges of motions for the activity depicted in the one set of joint motion image data used to generate the set of artificial implant model data includes:

generating a set of differential dimensional data in response to the comparison indicating that the artificial implant model did not correspond to the ranges of motions for the activity depicted in the one set of joint motion image data.

44. (Canceled).